

Texture Mapping



Map a 2D Texture onto an Object

- How?

Consider a Cylinder

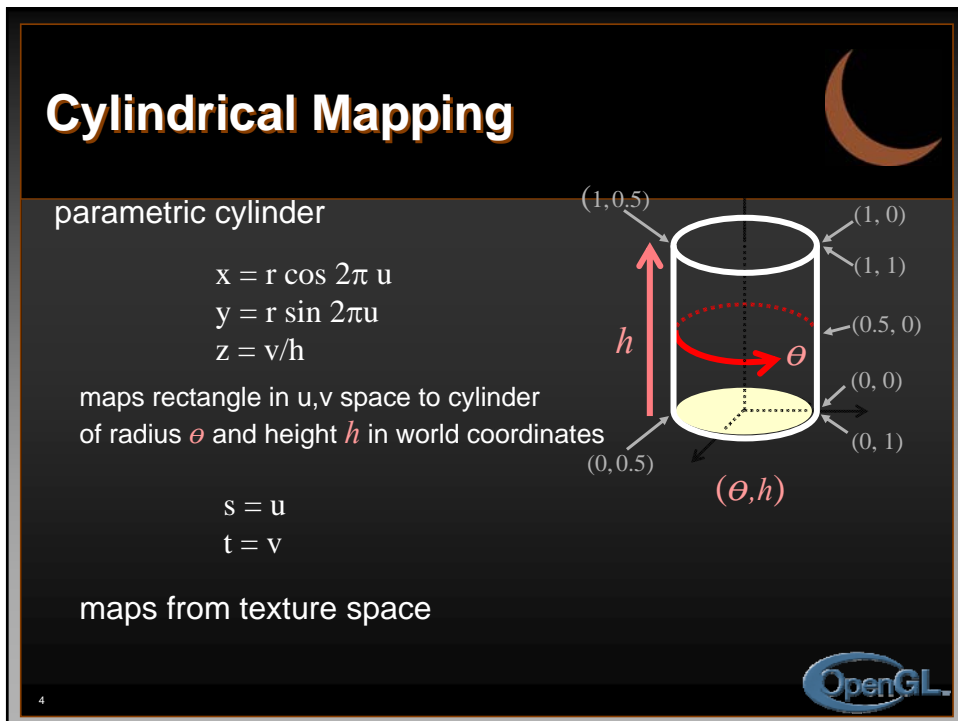
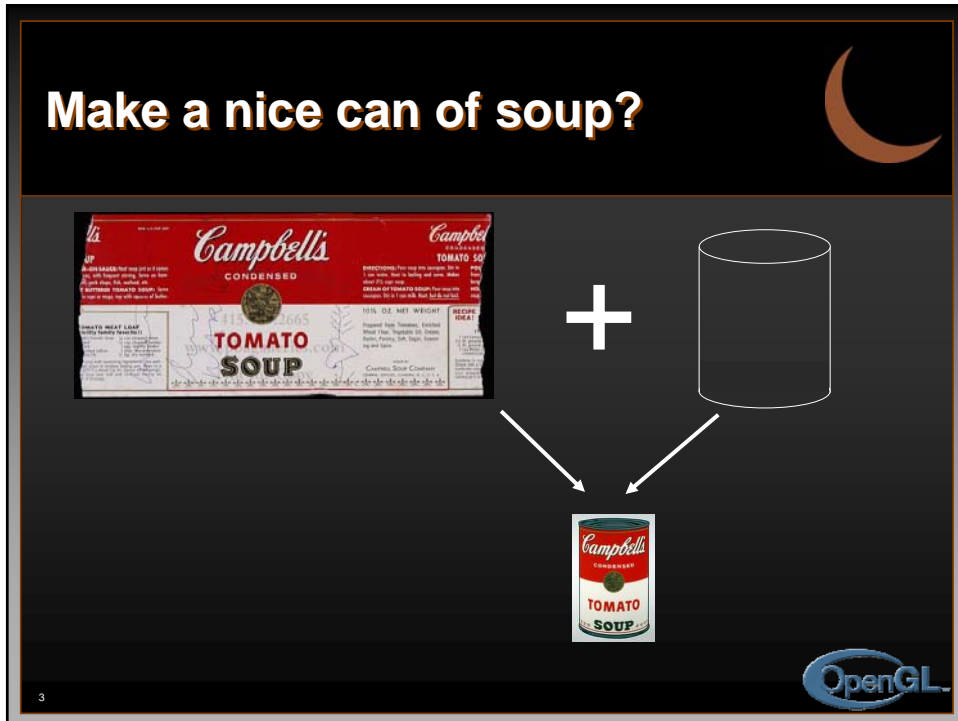


1

Make a nice can of soup?



2



Texture Mapping

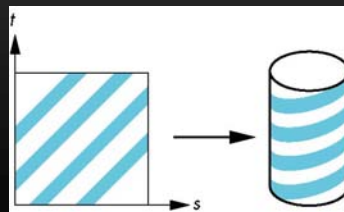
What if we don't have a cylinder or sphere?

5



Two-part mapping

- One solution to the mapping problem is to first map the texture to a simple intermediate surface
- Example: map to cylinder



6



Cylindrical Mapping

parametric cylinder

$$x = r \cos 2\pi u$$

$$y = r \sin 2\pi u$$

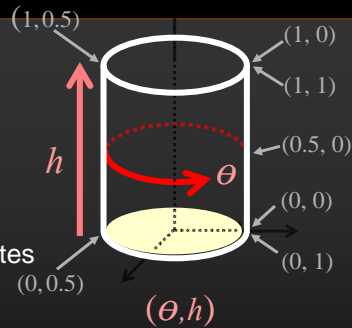
$$z = v/h$$

maps rectangle in u, v space to cylinder
of radius r and height h in world coordinates

$$s = u$$

$$t = v$$

maps from texture space



Spherical Map

We can use a parametric sphere

$$x = r \cos 2\pi u$$

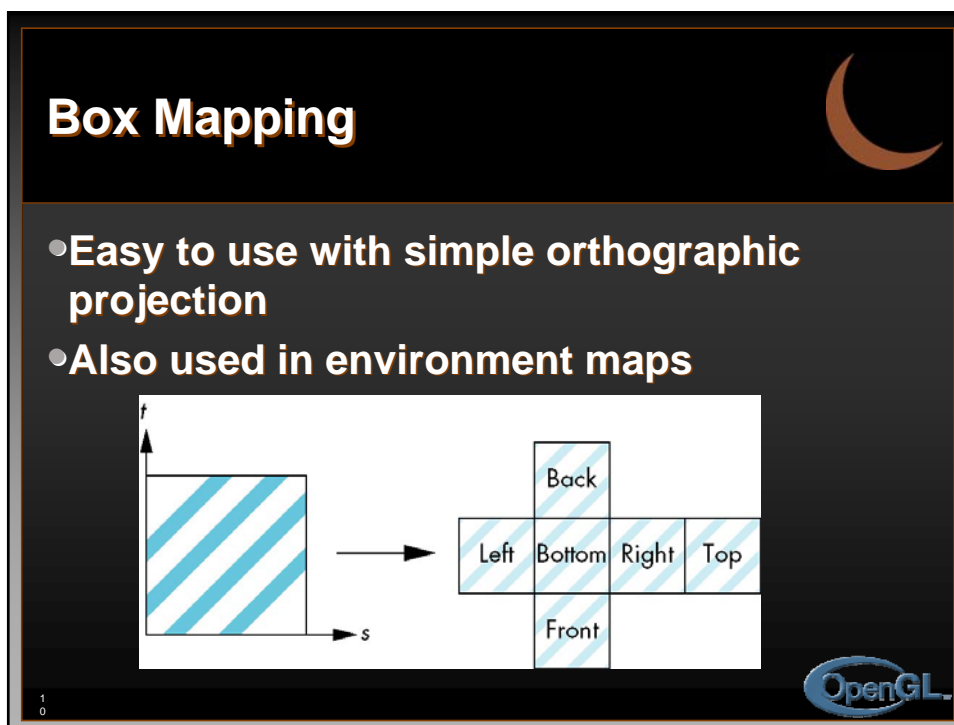
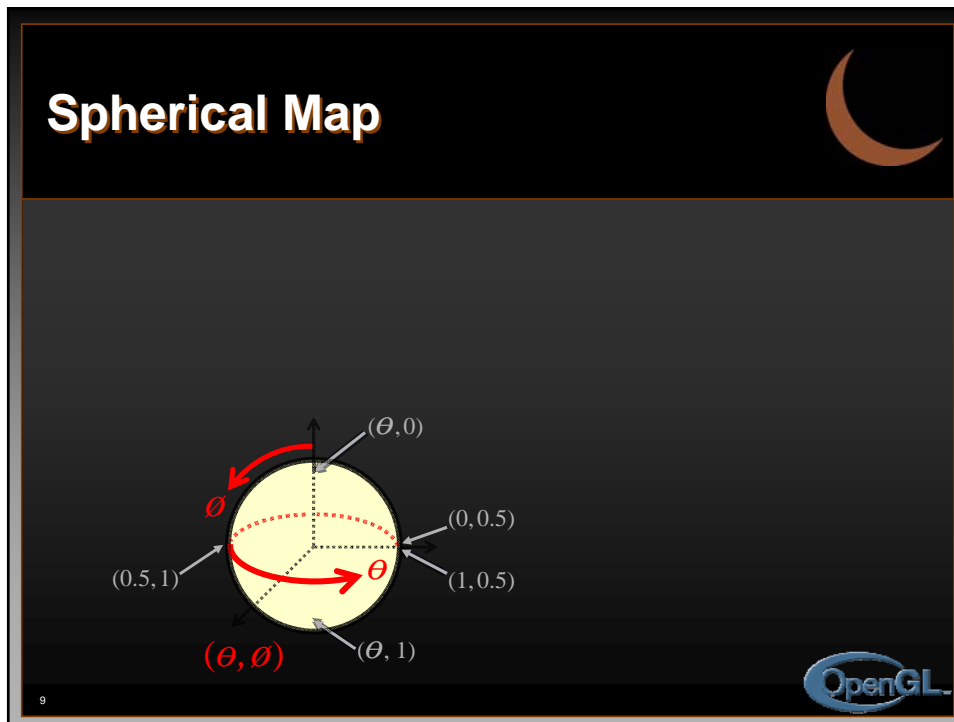
$$y = r \sin 2\pi u \cos 2\pi v$$

$$z = r \sin 2\pi u \sin 2\pi v$$

in a similar manner to the cylinder
but have to decide where to put
the distortion

Spheres are used in environmental maps





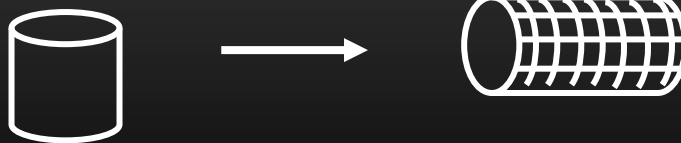
Texture Mapping during Modeling

- Banana?



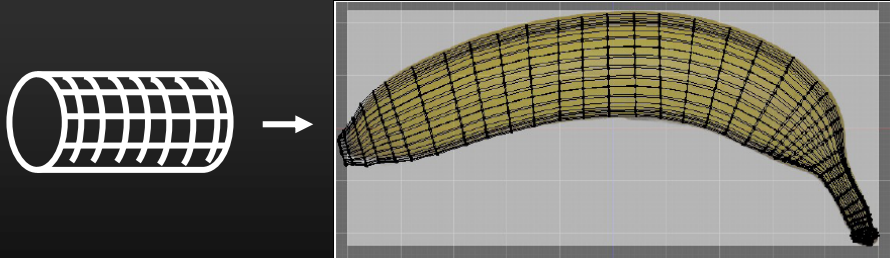
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Texture Mapping during Modeling

- Banana?




The diagram illustrates the initial modeling step. On the left, a simple white wireframe cylinder is shown. An arrow points to the right, where a more complex wireframe mesh of a banana is displayed. The banana mesh is curved and has a more detailed structure, including a stem at the bottom right. The background is a dark gray grid.

1
3




Texture Mapping during Modeling

- Banana?



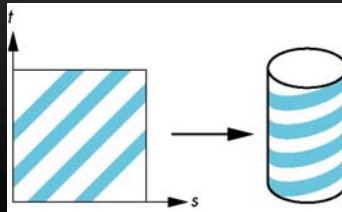
The diagram illustrates the texture mapping process. It shows a wireframe mesh of a banana (from the previous slide) followed by a plus sign and a yellow texture with black spots. Below this, an equals sign is followed by a rendered yellow banana with the texture applied. The background is a dark gray grid.

1
4



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1
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S Mapping

$T(s,t) \rightarrow T'(x,y,z)$: Map texture onto an intermediate surface

$T'(x,y,z) \rightarrow O(x,y,z)$: Map intermediate surface onto the object

1
6



Cylindrical Mapping

parametric cylinder

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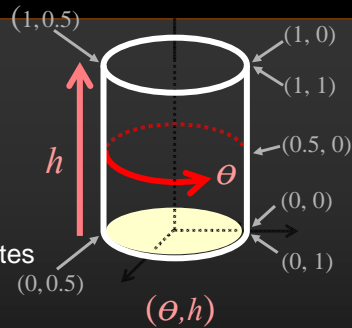
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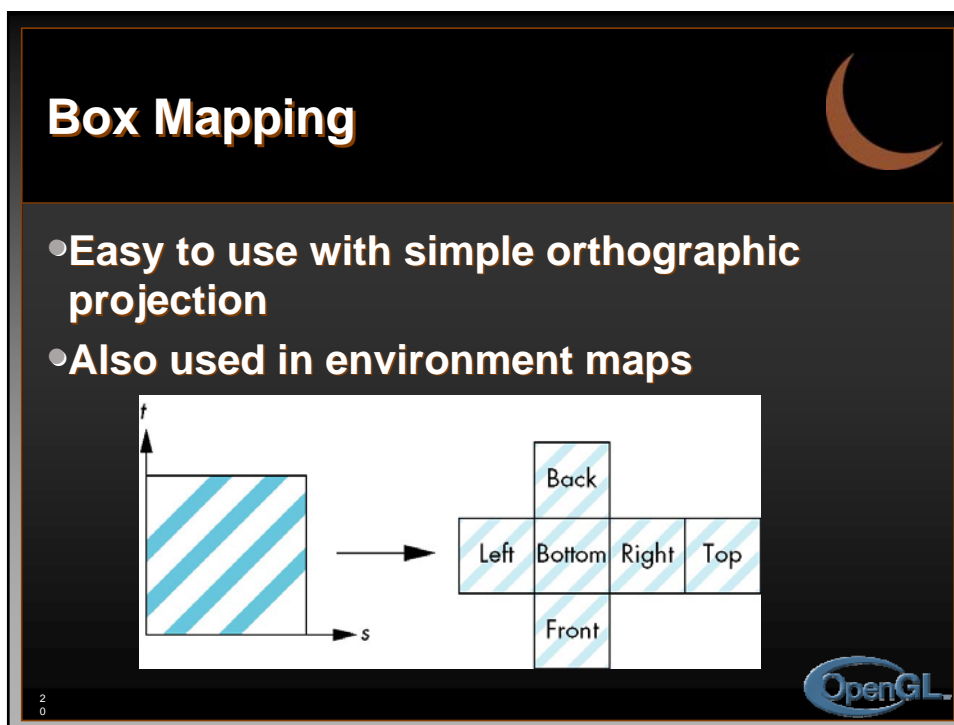
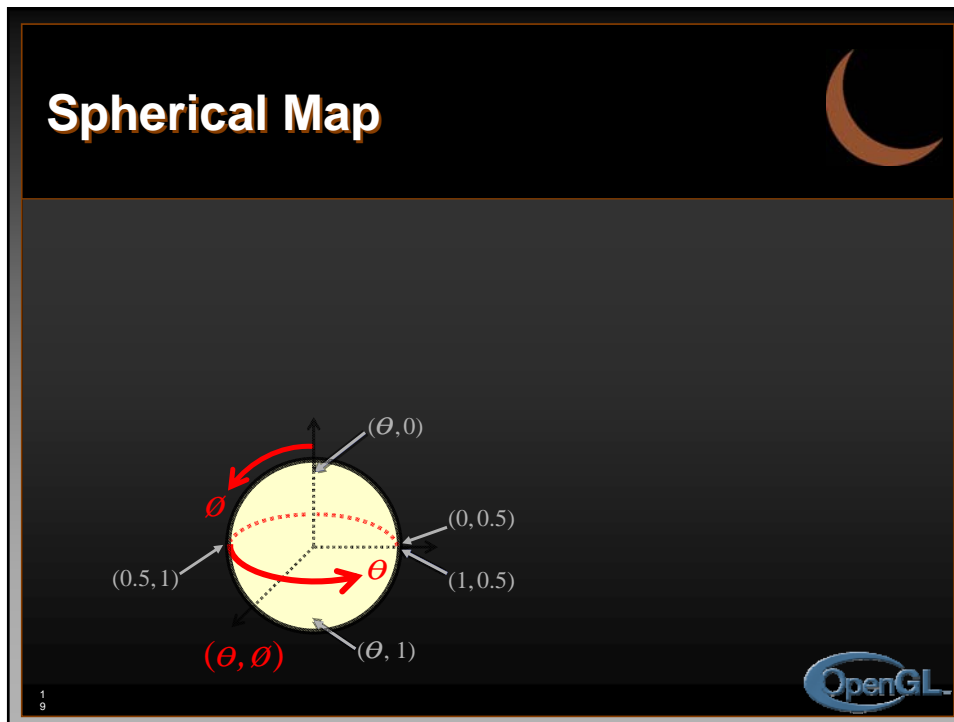
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Second Mapping

- **Map from intermediate object to actual object**

- Normals from intermediate to actual
- Normals from actual to intermediate
- Vectors from center of intermediate

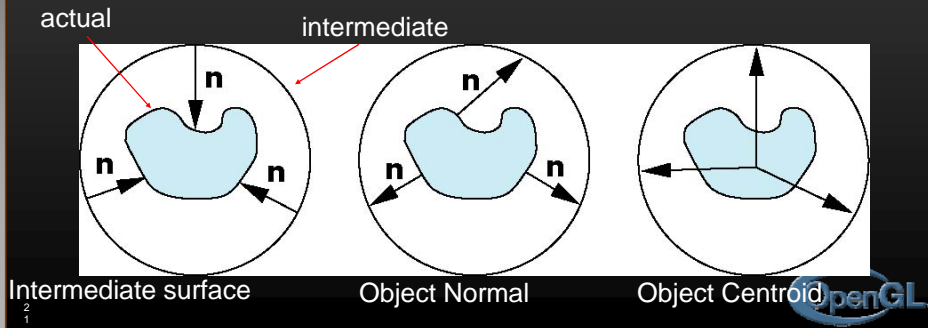



Table 1

	Single Valued	Invertible	Continuous
Object Normal	Yes	Not efficient	If surface normal is
Object Centroid	Yes	Yes	Yes
Intermediate surface Normal	With help	Yes	Rarely

Table 2


	Cylinder	Box	Sphere	Plane
Object Normal	Bad	OK	OK	Bad
Object Centroid	Bad open cyl	Centroid Box	Centroid Sphere	OK
Intermediate Surface Normal	Shrink wrap	ISN/Box	Redundant	Slide Proj



2
4

Table 2

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2
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